

DEPARTMENT OF HEALTH AND HUMAN SERVICES

Public Health Service

National Institutes of Health

National Institute of Dental and Craniofacial Research

National Advisory Dental and Craniofacial Research Council

Summary Minutes

Date: September 27-28, 1999

Place: Building 31, Conference Room 10  
National Institutes of Health  
Bethesda, Maryland 20892

DEPARTMENT OF HEALTH AND HUMAN SERVICES  
NATIONAL INSTITUTES OF HEALTH  
NATIONAL INSTITUTE OF DENTAL AND CRANIOFACIAL RESEARCH

MINUTES OF THE  
NATIONAL ADVISORY DENTAL AND CRANIOFACIAL RESEARCH COUNCIL

September 27-28, 1999

The 159th meeting of the National Advisory Dental and Craniofacial Research Council (NADCRC) was convened on September 27, 1999, at 9:35 a.m., in Building 31, Conference Room 10, National Institutes of Health (NIH), Bethesda, Maryland. The meeting was open to the public from 9:35 a.m. to 5:40 p.m., followed by the closed session for consideration of grant applications from 9:00 a.m. on September 28, 1999, until adjournment at 2:00 p.m. Dr. Harold C. Slavkin presided as Chair.

Members Present:

Dr. Judith E. N. Albino  
Dr. John F. Alderete  
Dr. Ernesto Canalis  
Dr. D. Walter Cohen  
Dr. Dominick P. De Paola  
Dr. Caswell A. Evans, Jr.  
Dr. Jay Alan Gershen  
Dr. Marjorie K. Jeffcoat  
Dr. Harold Morris  
Dr. E. Dianne Rekow  
Dr. Martha J. Somerman  
Dr. Everett Vokes

Members of the Public Present:

Dr. Charles Bertolami, Dean, School of Dentistry, University of California at San Francisco  
Dr. Aida A. Chohayeb, Professor, School of Dentistry, Howard University, Washington, D.C.  
Dr. Robert J. Collins, Deputy Director, American Association for Dental Research (AADR) and International Association for Dental Research (IADR), Alexandria, VA  
Dr. Marc Heft, University of Florida, Gainesville, and current Harald Loe Scholar, NIDCR  
Dr. Cynthia E. Hodge, President, National Dental Association, Washington, D.C.  
Mr. Smil Iyengar, *The Blue Sheet*, Chevy Chase, MD  
Dr. Preston A. Littleton, Jr., Education Director, International Federation of Dental Education Association, Potomac, MD

Dr. Robert E. Mecklenberg, Dental Coordinator, Smoking and Tobacco Control Program,  
National Cancer Institute, NIH  
Ms. Pamela S. Moore, Capitol Publications, Inc., Alexandria, VA  
Dr. Dorothy Moss, American Dental Association (ADA), Washington, D.C.  
Mrs. Lois Slavkin, Past Executive Director, Center to Advance PreCollege Science Education,  
University of Southern California, Los Angeles  
Ms. Kim Uhrich, Board of Directors, Cleft-Palate Foundation, and Case Manager, University of  
North Carolina Craniofacial Center, Chapel Hill, NC  
Dr. Richard Valachovic, Executive Director, American Association of Dental Schools,  
Washington, D.C.

Federal Employees Present:

National Institute of Dental and Craniofacial Research:

Dr. David Barmes, Special Expert, Office of International Health (OIH)  
Ms. Carolyn Baum, Committee Management Specialist and Council Secretary, Office of  
Science Policy and Analysis (OSPA)  
Ms. Carol M. Beasley, Chief, Human Resources Management Branch, Office of Administrative  
Management (OAM)  
Ms. Karina Boehm, Education Specialist, OCHE  
Dr. Norman S. Braveman, Associate Director for Clinical, Behavioral, and Health Promotion  
Research, Division of Extramural Research (DER)  
Dr. Patricia S. Bryant, Health Scientist Administrator, Behavior, Health Promotion, and  
Environment Program, Program Development (PD), DER  
Ms. Sharrell S. Butler, EEO Manager  
Dr. Lois K. Cohen, Director, OIH  
Dr. James Corrigan, Evaluation Officer, OSPA  
Mr. George J. Coy, Chief, Financial Management Branch, OAM  
Ms. Pam Curry, Grants Technical Assistant (GTA), DER  
Ms. Mary Daum, Science Writer/Editor, Public Information and Liaison Branch (PILB),  
OCHE  
Ms. Jody Dove, Public Information Specialist, PILB, OCHE  
Ms. Yvonne H. du Buy, Executive Officer and Chief, OAM  
Ms. Pamela Fettau, GTA, DER  
Ms. Carla G. Flora, Chief, Information Technology and Analysis Branch (ITAB), OCHE  
Dr. Isabel Garcia, Special Assistant for Science Transfer, OCHE  
Ms. Christen Gibbons, Computer Specialist, ITAB, OCHE  
Dr. Sharon Gordon, Director, Office of Education, Division of Intramural Research (DIR)  
Dr. Kenneth A. Gruber, Director, Chronic Disabling Diseases: Osteoporosis and Related Bone  
Disorders Program, PD, DER  
Dr. H. George Hausch, Chief, Scientific Review Branch, Program Operations (PO), DER

Ms. Deane K. Hill, Computer Programmer, Planning, Evaluation, and Legislation Branch (PELB), OSPA  
 Ms. Lorryayne Jackson, Diversity Program Specialist, and Co-Director, Diversity Programs, DER  
 Dr. Bernard W. Janicki, Special Assistant, DER  
 Dr. Dushanka V. Kleinman, Deputy Director, NIDCR, and Executive Secretary, NADCRC  
 Dr. Eleni Kousvelari, Director, Biomaterials, Biomimetics, and Tissue Engineering Program, and Director, Infectious Diseases: AIDS Program, PD, DER  
 Ms. Wendy A. Liffers, Director, OSPA  
 Dr. James A. Lipton, Special Assistant for Training and Career Development, DER  
 Dr. Jack London, Special Assistant to the Director, DIR  
 Dr. Dennis F. Mangan, Director, Infectious Diseases Program, PD, DER  
 Dr. J. Ricardo Martinez, Director, DER  
 Ms. Yvonne Mulgrew, Secretary, Director, DER  
 Dr. Maryann Redford, Health Scientist Administrator, Office of Clinical, Behavioral, and Health Promotion Research, DER  
 Dr. Joyce Reese, Technology Transfer and SBIR/STTR Administrative Program, PD, DER  
 Dr. Edward Rossomando, Technology Transfer Program Director, Office of the Director (OD)  
 Dr. Martin Rubinstein, Chief, Grants Management Section (GMS), PO, DER  
 Dr. Ann L. Sandberg, Director, Neoplastic Diseases Program, and Director, Comprehensive Centers of Discovery Program, PD, DER  
 Ms. Patricia Sheridan, Writer, OCHE  
 Dr. Yong He Shin, Scientific Review Administrator, DER  
 Dr. Yasaman Shirazi, Scientific Review Administrator, DER  
 Dr. Harold C. Slavkin, Director, NIDCR  
 Dr. Judy A. Small, Director, Inherited Diseases and Disorders Program, PD, DER  
 Ms. Lynn Warwick, Secretary to the Director, NIDCR  
 Dr. Philip Washko, Scientific Review Administrator, DER  
 Ms. Nora Winfrey, Secretary, DER

Other Federal Employees:

Dr. Clifton Carey, Paffenbarger Research Center of the ADA Health Foundation, National Institute of Standards and Technology, Department of Commerce, Gaithersburg, MD  
 Dr. Priscilla Chen, Center for Scientific Review, NIH  
 Dr. Carmen Jaramillo, Centers for Disease Control and Prevention, Atlanta, GA  
 Ms. Susan Matthews, National Institute of Mental Health (NIMH), NIH  
 Ms. Linda Robbins, NIMH, NIH  
 Ms. Kate Whelan, Committee Management Officer, NIMH

OPEN PORTION OF THE MEETING

## I. CALL TO ORDER AND WELCOMING REMARKS

Dr. Harold C. Slavkin, Director, NIDCR, called the meeting to order, welcoming all attendees to the 159th meeting of the Council. He noted that the presentations and discussions during the meeting would serve as a foundation for the Institute's future research training activities. He invited all attendees to introduce themselves.

The terms of two Council members will expire at the end of November 1999. Dr. Slavkin thanked Drs. Judith E. N. Albino and Caswell A. Evans, Jr., for their participation on the Council. He presented each with a certificate of appreciation and the gift of an NIDCR plaque.

## II. APPROVAL OF MINUTES

The minutes of the Council's meeting on May 24-25, 1999, were considered and unanimously approved.

## III. FUTURE COUNCIL MEETING DATES

The following dates for future Council meetings were confirmed:

January 20-21, 2000  
June 8-9, 2000  
September 21-22, 2000

January 22-23, 2001  
June 12-13, 2001  
September 24-25, 2001

## IV. REPORT OF THE DIRECTOR

Dr. Harold C. Slavkin, Director, NIDCR, commented on NIDCR's activities over the past 3 months. He noted that, during this time, the Council has been more intimately involved in the Institute's activities than ever before. Members have participated in a variety of workshops and on different panels and committees to help determine scientific directions and ways to improve the research infrastructure. The proceedings of these gatherings have been posted on the NIDCR homepage to encourage broader public involvement in shaping the Institute's agenda. Dr. Slavkin's written Director's Report to the NADCR was provided previously to the Council members and is appended to these minutes as Attachment III.

Dr. Slavkin called attention to three recent publications pertaining to research training, which were made available to the attendees. The publications are: Trends in the Early Careers of Life Scientists (National Academy Press, 1998); an entire issue of Science (vol. 285, no. 5433, 3 September 1999) on the state of postdoctoral training; and an entire issue of The Journal of the American Medical Association (vol. 282, no. 9, September 1, 1999) on undergraduate and postgraduate medical education in the United States. Dr. Slavkin said that the NIDCR has an opportunity to contribute to the national agenda suggested in these publications, by seeking to improve the quality of research training and to ensure that training is a lifelong activity.

He noted that the NIDCR's Blue Ribbon Panel on Research Training and Career Development was a significant step in this direction. Cochaired by Dr. Charles Bertolami, Dean, School of Dentistry, University of California at San Francisco, and Dr. Joseph Martin, Dean, Harvard Medical School, Cambridge, Massachusetts, the panel met at the NIH on July 27-28, 1999. Several Council members participated in the in-depth discussions of scientific opportunities for the 21st century and the competencies required to respond to these opportunities. A preliminary draft of the panel's report was provided to the Council.

Referring to the panel's deliberations, Dr. Slavkin commented on the opportunities for oral health research in the 21st century and the science training needed to respond to these opportunities. He noted that, as more and more individuals live into their 80s and 90s, health will be defined in terms of quality of life, rather than absence of disease. Scientists will therefore need to be more sophisticated in understanding the genetic aspects of health and disease and to be more knowledgeable about the social and behavioral aspects of human interaction. Indeed, quality of life is fast becoming the agenda for public organizations and for private individuals. To respond to this agenda, scientists must be encouraged to keep an open attitude of curiosity throughout their careers and a readiness for collaborating with others to solve problems. Dr. Slavkin noted that figuring out how to reward the collective efforts of scientists is already a challenge, in part brought on by worldwide use of the Internet for sharing scientific data and information.

As biology moves from a descriptive, occasionally analytical activity to a computational, concept-based activity, scientists in the 21st century also will need to be skilled in computational biology and be able to manipulate complex datasets and report findings in effective ways that are relevant for enhancing quality of life. Further, science is becoming increasingly international and research opportunities are being extended globally to focus on different patterns of disease in diverse populations, cultures, and countries. U.S. scientists will need to be culturally receptive to these opportunities and excited and willing to participate in international collaborations.

Dr. Slavkin suggested that more individuals will be able to prosper if society is prepared to engage in the opportunities offered by science and technology, which "is rolling at a pace that is awesome." The challenge for scientists is to translate and diffuse new knowledge effectively to all populations so that individuals can incorporate into it their decisionmaking and make healthy choices. Interactions linking elementary, middle, and high schools with local universities is a promising strategy in this regard.

Yet, in this time of a robust economy, dental and medical schools and professional organizations share "an enormous angst" about the scientific and health professional workforce for the 21st century. Dr. Slavkin emphasized that the Congress, the Administration, and the scientific community must revisit in a creative way the societal emphases needed to "handmake gifted men and women" into research scientists. With only 9 percent of college students currently going into science and an even smaller percentage continuing into advanced training and residency programs, the potential that the pool of scientific talent in the United States will dry up is very real indeed. Improved programs are needed to identify, recruit, retain, promote, and nurture young scientists interested in research careers. Dr. Slavkin noted especially that only 1 percent of the principal investigators on domestic NIH R01 grants are from historically underrepresented minority groups, although these groups represent 22 percent of the U.S. population. Greater participation of these individuals in the scientific workforce is particularly needed for clinical research.

The 21st century is already being characterized as a postgenomic era in which scientists will explore the human genome, which will be mapped by 2003. The hope is to unravel gene-gene interactions and the gene-behavior-environment interface to help reduce the burden of disease and improve quality of life. For dentistry, areas of interest include dental caries, head and neck cancer, and craniofacial birth defects. The current challenge is to "tool up" scientists to work effectively and collaboratively across disciplines within the new scientific environment.

In closing, Dr. Slavkin commented on two legislative items important to the NIH. Final action on NIH's FY 2000 budget is pending in the House and Senate. Dr. Slavkin noted that the markup by the House Appropriation Subcommittee includes a lifting of the cap on salaries of extramural investigators which, for principal investigators, is currently \$125,000 a year. Also, legislation has been proposed for reducing the payback on school loans for individuals who declare their intent to pursue clinical research focused on the health and well-being of children; loans could be reduced by \$35,000 per year of service, including research training.

Specific NIDCR activities over the past 3 months are described in detail in the written Director's Report (Attachment III).

## V. TRENDS IN RESEARCH AND RESEARCH TRAINING

Dr. Ricardo Martinez, Director, Division of Extramural Research, NIDCR, presented an overview of NIDCR trends in research and research training support from FY 1995 through FY 1999. The data served as a framework for the Council's later discussion of the report of the NIDCR's Blue Ribbon Panel on Research Training and Career Development. Dr. Martinez noted that collection of these data is an ongoing process and will continue over the next few months. He noted further that the FY 1999 data are estimates only since FY 1999 has not yet ended. Dr. Martinez commented separately on two types of activities: training and research. He welcomed the Council's suggestions of additional data that would be informative.

### NIDCR Training Support

Dr. Martinez showed the trends in NIDCR support of research training, FY 1995-99, by amount of dollars and number of awards for three types of awardees (i.e., program directors): those with a Ph.D. (and no D.D.S.), those with a D.D.S. or a D.D.S. and a Ph.D., and those with other degrees (e.g., M.D., Ph.D./M.D., D.D.M.). In his remarks, he focused on the first two types of awardees and noted that the data for FY 1999 reflect similar trends in the distribution of dollars and awards over the past 5 years.

In FY 1999, NIDCR support across all mechanisms of training amounted to approximately \$4.6 million for individuals with a Ph.D. (30-34 awards), compared with slightly more than \$8 million for individuals with a D.D.S. or D.D.S./Ph.D. (68 awards). Individuals with a Ph.D. (principal investigators) receive most of the NIDCR support for T32 awards, amounting to \$2.8 million in FY 1999. Individuals with a D.D.S. or D.D.S./Ph.D. also receive substantial support from T32 awards and from K16 awards.

### Extramural Research Support

The trends in NIDCR support of extramural research, FY 1995-99, also have favored individuals with a Ph.D. In FY 1999, NIDCR support for all research project grants (RPGs) awarded to individuals with a Ph.D. amounted to approximately \$68 million (about 250 awards), compared with approximately \$40 million for individuals with a D.D.S. or D.D.S./Ph.D. (about 156 awards). Dr. Martinez noted that individuals with a Ph.D. submit most of the applications for competing investigator-initiated research grants (R01s) (almost 300 applications in FY 1998) and receive most of the R01 awards (more than 200 in FY 1999), which amounted to approximately \$54 million in FY 1999. Together, individuals with a D.D.S. or D.D.S./Ph.D. received half the number of awards, or about 94 competing R01s, which amounted to approximately \$26 million in FY 1999. Responding to a question from Council, Dr. Martinez noted that the 94 awards were distributed about equally between individuals with a D.D.S. and those with a D.D.S./Ph.D.

Dr. Martinez also reported data on the amount of NIDCR support for R01s, FY 1997-99, by the Institute's seven areas of scientific emphasis. In FY 1999, for individuals with a Ph.D., most of the dollars awarded supported research on infectious diseases, with some support for research on chronic diseases, biomaterials, and neoplastic diseases. The distribution of dollars was similar for grantees with a D.D.S. or D.D.S./Ph.D., except for neoplastic diseases, which received much less research attention. Responding to a question from Council, Dr. Martinez said that the area of behavior, health promotion, and environment, is currently a relatively small part of the NIDCR portfolio but is expected to grow as applications are received in response to recent NIDCR initiatives.

### Discussion



The Council emphasized the need for additional data before making any decisions about current and future training programs. Members asked about the percentage of RPG awardees who previously received NIDCR training support, the location of R01 awardees (e.g., medical, dental, or graduate schools), and trends over the past 10 years. Focusing on the perceived value of having a dual degree (D.D.S./Ph.D.) compared to a single degree (D.D.S. or Ph.D.), the members asked for comparative data on the number of applications, the success in obtaining research and research training awards, the influence of factors such as age and previous training support (e.g., postdoctoral fellowships) on success, and the types of R01s awarded (for basic or clinical research) for each group. Data also are needed to clarify whether adding a postdoctoral experience to the Dentist Scientist Award (DSA) Program conveys an advantage in obtaining subsequent research awards.

The Council also asked about the type of research being conducted (e.g., basic, translational, applied, health services) in NIDCR's areas of scientific emphasis and other sources of support for research training in dentistry (e.g., other NIH institutes, other Federal agencies, the private sector).

Commenting on the location of awardees, Dr. Dushanka Kleinman, Deputy Director, NIDCR, said that approximately 70 percent of NIDCR's R01 awards are awarded to principal investigators in dental schools. Dr. Martinez noted that staff are collecting and analyzing data on the issues raised by Council and will use these data to guide NIDCR's activities for training the researchers of the future, as identified by the Blue Ribbon Panel. Dr. Slavkin commented that a different configuration for training will be needed to develop the interdisciplinary teams that will be essential for biotechnology research in the 21st century. He noted that the NIH is already responding to the need for more translational and clinical research, as recommended in the Nathan's Report (December 1997), by initiating the new (K23, K24, and K30) mechanisms, which were funded for the first time in July 1999. The Council encouraged the NIDCR to focus on the interdisciplinary research environment and the "mix" of individuals and skills that will be needed for conducting interdisciplinary research within this environment, in addition to the training of individuals who can cross disciplines.

## VI. OVERVIEW OF THE BLUE RIBBON PANEL ON RESEARCH TRAINING AND CAREER DEVELOPMENT REPORT

Dr. Charles Bertolami, cochair of the Blue Ribbon Panel, presented his perspective on the panel's draft report. Following his remarks, several Council members who participated in the panel meeting served as discussants and commented on key issues.

Dr. Bertolami emphasized that the draft report is very preliminary and will be revised extensively during the next several weeks. As previously noted by Dr. Slavkin, the charge to the panel was "to identify the major emerging scientific opportunities of the 21st century and to recommend the competencies required by investigators to pursue those opportunities." The panel of 15 members was extremely diverse and included dental and medical professionals and others less knowledgeable about the oral health sciences.

Dr. Bertolami highlighted two main themes and two primary conclusions from the panel's wide-ranging discussions. First, the panel strongly endorses the Institute's Strategic Plan, Shaping the Future (June 1997), including the research opportunities and relevant competencies listed in the plan. In particular, the panel strongly endorses multi-, cross-, and interdisciplinary training programs. Second, the panel also endorses the need for strong disciplinary training in the field of dentistry. Supporting evidence for this second conclusion includes the tremendous decline in number of R01s awarded to M.D.s and, similarly, to D.D.S. and D.M.V. applicants; the number of dental schools (10) that do not receive any research or training funds from NIDCR or receive only limited funds (approximately 10 schools receiving < \$100,000); and deficiencies in meeting the demand for dental school faculty (the American Association of Dental Schools estimates that 2.0 percent of graduating dental students are needed, but only 0.5 percent currently enter dental education).

Dr. Bertolami noted that these two themes present a particular dilemma for the NIDCR, which the panel will consider in developing its recommendations: how can NIDCR support the best science and, at the same time, fulfill its mandated mission in public health by addressing the needs of dental education (in the nation's 54 dental schools) and dental practice (among ~ 150,000 dental practitioners). One question is to what extent the NIDCR should or can take ownership of this problem? The panel agreed that the NIDCR should view the nation's dental schools as a national resource to be preserved and cultivated.

Dr. Bertolami suggested that one panel recommendation, related to this issue, is particularly relevant for the Council's discussion. The recommendation is to utilize the Request for Applications (RFA) mechanism to foster collaborative interdisciplinary studies that include a significant role for dental clinical practitioners. The aim is to encourage dental school investigators to collaborate with others in the broader medical and research environment and to encourage Ph.D. researchers to collaborate with dental school partners in addressing oral health problems.

### Discussants

Dr. Marjorie K. Jeffcoat commented that the panel agreed that there is a crisis in both recruitment and retention of clinical investigators, but that the actions needed to resolve this crisis are less clear. For recruitment, a main question is how to select and motivate students who are most driven to solve research problems. For retention, a main question is whether to create separate tracks to train the different members of interdisciplinary research teams or to offer individuals combined training in different disciplines. Further attention also is needed to the barriers against entering a research career (e.g., the availability of research-inclusive jobs, appropriate mentors, interdisciplinary research environments, role models, competitive salaries, and loan-payback options).

Dr. D. Walter Cohen noted that the NIDCR is still "a well-kept secret" from the American public, including the dental profession. This fact was apparent from some panelists' lack of knowledge about dentistry and is reflected in the failure to capture the research imagination of dental students.

Dr. Cohen emphasized the need for NIDCR outreach to dental schools and the broader public. Recruitment of dental researchers is a major problem. Dr. Cohen highlighted three ways of addressing this problem: encouraging more problem-based learning in the dental curriculum, offering loan-forgiveness programs, and educating medical colleagues about the relationships between oral and systemic diseases. He also noted that introduction of Ph.D.s to the dental profession was a successful model used in the past and may be less difficult than trying to recruit dental students into research.

Dr. Caswell A. Evans, Jr., highlighted one important theme, the disconnect between science and the public, particularly as it relates to populations of color. He noted that the problem of recruiting and retaining of qualified individuals in research and teaching is exacerbated for these populations, and increasingly so among the young people who are not conversant with electronic information technologies. For these populations, application and matriculation into dental schools may be further hindered by admission policies that convey messages of "welcome or unwelcome," and recruitment into research or teaching careers may be hindered by the lack of role models. Dr. Evans noted that these problems were well presented to the panel, opening an opportunity for serious consideration. Dr. Bertolami highlighted a new post-baccalaureate, summer residential program at the University of California at San Francisco which has been very successful in recruiting talented, but disadvantaged, college graduates into dental schools.

Dr. E. Dianne Rekow emphasized the need to fully address the issue of multidisciplinary research. Some of the relevant factors to examine include the reward system for accountability, promotion, and crediting of individuals and institutions who participate in interdepartmental and cross-institutional research; NIH grant reviewers' appreciation of the unique aspects of interdisciplinary research proposals; lack of flexibility in dental school training programs; inadequate recognition by DSA awardees of the two-way nature of the nation's investment in them; assuring selection of students who are driven to become researchers; and training team leaders for interdisciplinary research. Dr. Rekow urged that young people be invited to contribute their perspectives and experiences to the discussion of new training paradigms.

### General Discussion

Dr. Slavkin noted that the panel also indicated a need to begin developing a "stream of talent" in the early school years so that the possibility of pursuing a research career would be embedded in some students at the high school level. Their research interests could then be nurtured throughout high school and college by a feeder system that couples magnet high schools with academic health centers, a model that already is in use in California.

Dr. Bertolami commented that the "culture" of "doing good" through research, as well as practice, may exist in medical schools but has not yet been firmly established in dental schools.

Characteristics shared by both environments, which augur against research, include the implausibility of research careers that is conveyed to students, the dearth of research scientists to serve as role models, and the difficulty of perceiving of research as "doing good." The Council suggested that documentation of the research careers of heroes in science (e.g., videotaped biographies of Nobel

Laureates) may be helpful in stimulating young people to pursue research. The American College of Dentists, for example, is documenting a series of interviews with individuals for a dental hall of fame.

The Council noted that the best recruitment efforts in K-12 will not yield results unless the environment of dental schools is changed to be more receptive to research. Members suggested that the NIDCR and the dental professional organizations, through a combined effort, could offer financial incentives for revising dental school curricula (e.g., by funding pilot programs) and for fostering faculty research (e.g., by supporting collaborative partnerships with research-intensive schools or academic health centers). Increasing NIDCR's outreach and visibility in dental schools also would be useful.

## VII. EXPLORING OPPORTUNITIES AND CHALLENGES RELATED TO THE BLUE RIBBON PANEL REPORT RECOMMENDATIONS: IMPLEMENTATION PLAN

Dr. Martinez introduced the afternoon session for exploring opportunities and challenges related to the draft report and recommendations of the Blue Ribbon Panel. Dr. James A. Lipton, Special Assistant for Training and Career Development, DER, set forth the overall process for developing an Institute training and career development plan. The process consists of four sequential phases: convening of the Blue Ribbon Panel, developing an implementation plan in response to the panel's recommendations, implementing the plan through NIDCR initiatives (RFAs, program announcements), and evaluating accomplishments 3 to 5 years later. For reference, Dr. Lipton distributed a handout listing NIDCR's current mechanisms of support for research training and career development for predoctoral students, postgraduate/postdoctoral scientists, and independent scientists.

### Charge to Work Groups

The Council was divided into four work groups to discuss two major issues addressed in the Blue Ribbon Panel's report: core competencies, diversity, and metrics; and recruitment, retention, threats, and partnerships. The charge consisted of a series of questions under each issue, as follows:

*Core Competencies, Diversity, and Metrics.* (1) What core competencies (in addition to those identified by the Blue Ribbon Panel) should future scientists, regardless of particular research area, possess? (2) How can we insure the presence of an adequate number of women and underrepresented minorities among investigators? (3) What are the most appropriate developmental milestones and metrics to assess individual trainees and multidisciplinary teams, as well as training and career development programs?

*Recruitment, Retention, Threats, and Partnerships.* (4) How can we extend our recruitment efforts of potential investigators? (5) What provisions should be introduced to increase the yield from

training? (6) What are the external threats to the success of young investigators and of training and career development programs? (7) What partnerships and collaborations are possible to enhance future research training and career development efforts? How can we maximize extramural-intramural partnerships for future training?

Each work group was asked to answer these questions in relation to a particular population in the research training pipeline. Group 1 focused on K-12 and college students; group 2 focused on professional training levels (graduate and health professional students); group 3 considered postdoctoral training; and group 4 addressed independent and established investigators. The work groups met for approximately 2.5 hours, and attendees were invited to join Council members in the "brainstorming" sessions.

## VIII. WORK GROUP REPORTS AND DISCUSSION

For each work group, the chairperson presented a 15-minute report of the group's conclusions regarding the questions posed.

### K-12 and College

Dr. John Alderete, chairperson of Group 1, noted that the perception of the public is that the NIDCR and the NIH are interested in, but doing very little to change, science education in grades K-12 and college. In their discussions, the work group focused on existing models of science education, the need for inquiry-based education, potential programs for college students, mentoring, and the marketing of science education. Dr. Alderete emphasized the enormity and seriousness of the pipeline problem in grades K-12 and college in relation to the changing demographics in the United States. He noted, for example, that the Hispanic population in this country has the highest fertility rate but some of the lowest educational achievements. Almost one-half of Hispanic high school students do not graduate; of those who graduate, only 1 in 9 continue on to attend a 4-year institution of higher learning; and, for these, it takes 12 years to complete the 4-year program, largely because of lack of funds.

The work group encouraged the NIDCR to learn about and share information with institutions that currently support science education programs for K-12 and college. Examples include Charles R. Drew University of Medicine and Science, in Los Angeles, and partnerships between the National Institute of Environmental Health Sciences and a North Carolina high school and between the National Institute on Drug Abuse and various institutions. The work group noted that the NIDCR is cofunding three science education awards with the National Center for Research Resources, and the members urged NIDCR to disseminate more information about its mission and programs through such linkages.

Emphasizing the dearth of inquiry-based science education in the United States, Dr. Alderete estimated that 50 percent of K-12 teachers in Texas, and possibly California, will be retiring in 5-10

years and that 85 percent of the K-12 science teachers in Texas are not certified to teach science. Two efforts to promote inquiry-based education are the NIH's K-3 Science Education Committee and partnerships between the Society for the Advancement of Chicanos and Native Americans in Science (SACNAS) and professional organizations or Federal agencies to immerse K-12 teachers in 2.5 days of training. The work group suggested that the NIDCR could coordinate with or adopt these models to develop a "feeder system" for disseminating information.

The work group also encouraged the NIDCR and dental professional organizations to coordinate with groups representing underrepresented minority students, such as SACNAS, to identify college students interested in dental research and to support their travel to scientific meetings, participation in summer training programs, etc. Such a partnership is underway between SACNAS and the National Institute of Neurological Diseases and Stroke. The work group also suggested that the NIDCR could lead in the development of creative, innovative mechanisms for actively recruiting students into dentistry. Existing programs that are making an impact and in which the NIDCR could participate include a partnership between Baylor College of Medicine and the National Institute of General Medical Sciences, the provision of funds to R01 grantees to support mentoring of high school and college students, the University of Maryland Meyerhoff program, the NIH Undergraduate Scholars Program, and summer science education programs provided by community-based organizations in partnership with the Center for Health Policy Development.

To strengthen mentoring of K-12 and college students, the work group proposed that the NIDCR develop cofunding mechanisms with dental schools to support the participation of students in meetings of professional organizations for underrepresented minorities, such as the Hispanic Dental Association and the National Dental Association; partnerships with these organizations to develop mentoring strategies and to disseminate NIDCR information; Saturday morning science camps and health fairs; partnerships with health professions high schools; and joint activities with community-based organizations.

The work group noted that the NIDCR could lead in the development, packaging, and delivery of oral science information. Potential activities include partnering with the Edison Project to include NIDCR information, developing a mailing list of K-12 science teachers to receive NIDCR information, and disseminating information at local health fairs.

### Professional Training

Dr. Dominick De Paola, chairperson of Group 2, reported that the work group addressed the questions posed and proposed some solutions. Among the core competencies needed by future scientists (Q.1), the work group listed research administration, leadership training, intersection between research and health policy, communication skills and cultural competency, biostatistics, and understanding of the link between dental research and dental health and medicine.

To insure the presence of women and underrepresented minorities in science (Q.2) and to extend recruitment efforts in general (Q.4), the work group emphasized the following: clarify the goals and

messages for each group; continuously market programs to attract these individuals into the health professions; communicate and disseminate information locally, involve the communities, utilize emerging technologies, and interact with associated organizations within and outside the community; engage practitioners (for mentors and role models) by providing them appropriate and clear data about NIDCR and oral health research and by involving selected practitioners in science training and clinical research within the practice community; engage and involve specific minority groups in discussions and development of policies to recruit and retain women and minorities in professional education; ensure diversity in leadership and education; identify individuals with the potential to succeed; and rethink outcome measures of student performance.

The work group also noted several broader issues related to the critical matter of mentors and role models and relevant for all candidates for professional training. The group strongly suggested that the NIDCR require that mentors and role models be included in applicants' responses to RFAs and Requests for Proposals and be linked to specific projects. The group also encouraged the NIDCR engage the dental community in providing incentives (e.g., block grants to dental schools) for identifying and developing mentors and for creating visibility for clinical investigations as an integral part of dental education (e.g., by creating opportunities for endowed chairs).

Commenting on appropriate developmental milestones (Q.3), Dr. De Paola noted the need to establish appropriate measures for assessing progress at different levels. The work group suggested examples of such measures for individuals (e.g., response to RFAs, applications for and receipt of grants, publications, collaborations, participation on boards on nonprofit health organizations); research teams (e.g., institutional investment, infrastructure development, creation of new and innovative projects, research funds obtained, publications, leadership and coordination); programs (e.g., increased participation of women and underrepresented minorities); research portfolios (e.g., breadth of portfolio, extent of training and recruitment, targeted areas); and research administration (e.g., number of deans involved or interested in research).

Ways in which the NIDCR could catalyze an increased yield from training (i.e., by increased receipt of research grant awards and commitment to academic careers) (Q.5) include the following: more closely approximate the research training and clinical interest of trainees, provide early incentives and opportunities (e.g., "seed" monies to DSA or equivalent training) to engage students in research, collaborate with professional dental organizations to create continuing education opportunities for school administrators and research facility, encourage dental institutions to provide institutional bonuses for faculty who conduct research, provide retraining opportunities for faculty, encourage opportunities for short-term "virtual sabbaticals" and "virtual mentoring" for faculty to link up with outstanding researchers, partner with dental institutions to encourage infrastructure development, help strengthen the visibility of research (e.g., through student research groups) in dental and health professional schools, and identify opportunities for partnership with specific researchers in industry.

Addressing solutions, Dr. De Paola emphasized that they must be incentive-based. The work group proposed that the NIDCR nurture the creation of partnerships between research-intensive and nonresearch-intensive institutions (perhaps as a pilot program); partner with public and private

organizations to develop and study the feasibility of U.S. models of restructured dental curricula that integrate research and education and stimulate interaction between scientists and clinicians; capture the "lessons learned" by other institutions and schools of clinical education (e.g., health professions, nursing) and promote integrated, multidisciplinary training programs; provide funding for senior faculty affiliated with research to support them as mentors and role models; foster partnerships among industry, dental schools, and consumer groups to expand awareness of the severity of dental, oral, and craniofacial diseases (e.g., through conferences on research career development, followed by outreach and marketing); and collaborate with the professional dental organizations in utilizing the opportunity of the Surgeon General's Report on Oral Health to promote interest in oral health research and research training programs.

### Postdoctoral Training

Dr. Marjorie K. Jeffcoat, chairperson of Group 3, reported that the work group highlighted several overlying principles of postdoctoral training, proposed three models of postdoctoral training, and addressed the questions posed. She noted the following three principles "not to be breached": "piggybacking" the resources for postdoctoral training in oral health research onto other training programs in other schools within the university or area, assuring flexibility in training to meet the self-defined interests of trainees, and exploration of the possibility of payback by trainees.

Based on the interests of individuals and the different outcomes expected, the work group envisaged three models of postdoctoral training for oral health researchers, as follows. (I) The first, or traditional, model applies to individuals whose aim is to become a principal investigator in the basic sciences. Their training, conducted at the highest university standards, will be directed toward receiving a Ph.D. and D.D.S. or M.D. The outcomes expected include submission of R01 grant applications, need for mentoring, publications, and participation on a team until able to receive independent grant funding. (II) The second model applies to individuals whose main interest is to lead an interdisciplinary team with a clinical orientation. Their training must be flexible and will probably include clinical training and, perhaps, specialty training, beyond the D.M.D. and leading to a M.S. in clinical research. The outcomes expected would be the same as in model I, but focused on clinical, rather than basic, research. (III) The third model applies to individuals (e.g., dental faculty, Ph.D.s) whose aim is to participate on a clinical research team. Their training, in addition to their Ph.D. or dental or medical school training, would consist of short-term (3-6 months), home-based, focused curricula not leading to a degree. The outcomes expected include participation on a clinical research team and in writing publications, knowledge of clinical research rules and procedures, and motivation for further training. Dr. Jeffcoat noted that models II and III are new concepts for which specially designed programs would have to be developed.

On the questions posed, Dr. Jeffcoat noted that many of the work group's suggestions overlapped those of Group 2. She highlighted additions. With regard to core competencies (Q.1), the work group noted being able to read, listen, synthesize, and calculate. On the participation of women and underrepresented minorities (Q.2), Dr. Jeffcoat said that the participation of women in postdoctoral training has improved, but that minority groups are still underrepresented. The work group also



noted that recruitment efforts (Q.4) need to be extended to existing faculty and to Ph.D.s interested in the mission of NIDCR. Two provisions to increase the yield from training (Q.5) would be payback and flexible training programs. External threats to investigators and programs (Q.6) include biased study section review of clinical research applications, insufficient budgets, general finances, and institutions' competing commitments. Partnerships and collaborations (Q.7) are needed within universities to administer K30s and to integrate recruitment, training, and research by oral and nonoral centers. Videoconferences and the World Wide Web are significant tools for collaboration. The work group noted that increased dialogue between the extramural and intramural community is especially needed and, perhaps, could include opportunities for sabbaticals within the Division of Intramural Research.

#### Independent and Established Investigators

Dr. D. Walter Cohen, chairperson of Group 4, presented the work group's responses to the questions posed and noted the addition of an eighth question. The core competencies (Q.1) listed by the work group include conversion from a "computerphobe" to a "computerphile" (especially among senior investigators); grantsmanship; statistics; familiarity with new disciplines; ability to relate to industry; sense of technology transfer; mentoring skills; collaborative team skills; and awareness of international activities and multinational infrastructures, cultural differences, and research regulations. Ways to increase the participation of women in research (Q.2) include providing reentry training, institutional grants, executive leadership training, mentors, and an environment conducive to participation and retention in research. Milestones and measures of progress (Q.3) include grants, publications, patents, awards, and number of trainees.

Incentives for extending recruitment of independent and established investigators (Q.4) include availability of endowed chairs (including at the NIH), adequate research support and space, increased salaries and benefits, appropriate organizational structures, and stimulating intellectual environments. The yield from training could be increased by setting annual goals and objectives, increasing salaries and benefits, establishing new (e.g., "golden pipette") awards for research accomplishments, providing support for trainees, and assuring the opportunity for professional research throughout the lifespan. External threats (Q.6) include "burnout," limited flexibility and independence, failure of institutions to adopt policies encouraging participation and promotion of women and underrepresented minorities, inability to retrain or change research directions, lack of support for high-risk new ideas, lack of supervision or oversight, failing infrastructures, academic overload, and overwhelming grantwriting responsibilities. Two specific threats for established investigators are: include inadequate salary and duration of support for K02 awards, and "unfriendly" F33 awards that should be modified for established investigators.

Several partnerships and collaborations could be enhanced (Q.7), including relationships between the NIH and research/academic institutions, between academia and industry, and among schools within the academic institution. The work group also suggested that center grants include the opportunity for training and career development, that the NIDCR explore training partnerships with other

institutions and nonprofit organizations, and that conferences and international meetings be convened to address these questions.

Adding an eighth question, the work group considered other opportunities for NIDCR outreach. Suggestions included conducting a survey of senior investigators to obtain insight on their careers and suggestions for modifying the training and career development programs; establishing closer relationships between investigators and NIDCR staff (e.g., visits by staff to review research progress); and increasing utilization of Interagency Personnel Agreements (IPAs) to bring academic researchers into government for short projects.

### Discussion

Dr. Slavkin noted the factors contributing to the present crisis in clinical research (e.g., unfilled faculty positions, a nonexistent national network for clinical research, a disconnect between the public and principal investigators, insufficient research personnel to meet the need for translational and clinical research over the next 20 years, costs of training, and the limitations of finite resources). He asked the Council to consider whether the NIDCR should skew its activities to meet the national needs and target its resources to translational and clinical research and research training.

The Council agreed that there is a crisis and that the Institute's approach to rethink its training and career development programs is appropriate. The members applauded NIDCR for convening the Blue Ribbon Panel. They encouraged the Institute to modify its programs and activities as needed (building into its programs the priority for translational and clinical research), to foster development of innovative pilot programs for training and career development, and to enlist the cooperation (through conferences and outreach) of other organizations (e.g., philanthropic, other Federal agencies) and larger audiences (including industry) in discussing and financing new training programs. Dr. Cohen noted that the Friends of the NIDCR could assist in the Institute's outreach efforts.

Dr. Kleinman thanked the work groups for their tremendous and expansive input. Staff will continue its discussion with Council over the next several weeks to complete the implementation plan in response to the Blue Ribbon Panel's report.

## IX. NIDCR VIDEO "A WAY OF LIFE: RESEARCH"

NIDCR staff showed a new 7-minute video, entitled "A Way of Life: Research," that is being used for recruitment of students into oral health research. The video highlights the excitement of scientific research as a career and features three NIDCR grantees: Dr. Douglass Jackson, a pain researcher at the University of Washington, Seattle; Dr. Dan Ramos, a cancer investigator at the University of California at San Francisco; and Dr. Mary McDougall, a craniofacial researcher at the University of Texas Health Science Center at San Antonio. Drs. Jackson and Ramos are former

DSA recipients, and Dr. McDougall is widely respected as a mentor of students. Dr. Slavkin also appears in the video. Staff are showing the video when they travel to colleges and dental schools to speak to students about research careers and training opportunities.

#### CLOSED PORTION OF THE MEETING

This portion of the meeting was closed to the public in accordance with the determination that it was concerned with matters exempt from mandatory disclosure under Sections 552b(c)(4) and 552b(c)(6), Title 5, U.S. Code and Section 10(d) of the Federal Advisory Committee Act, as amended (5 U.S.C. Appendix 2).

There was a discussion of procedures and policies regarding voting and confidentiality of application materials, committee discussions, and recommendations. Members absented themselves from the meeting during discussion of and voting on applications from their own institutions, or other applications in which there was a potential conflict of interest, real or apparent. Members were asked to sign a statement to this effect.

#### X. REVIEW OF APPLICATIONS

##### Grant Review

The Council considered 459 applications requesting \$88,013,486 in total costs. The Council recommended 304 applications for a total cost of \$52,288,874 (see Attachment II).

#### ADJOURNMENT

The meeting was adjourned at 2:00 p.m. on September 28, 1999.

#### CERTIFICATION

I hereby certify that the foregoing minutes are accurate and complete.

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Dr. Harold C. Slavkin  
Chairperson  
National Advisory Dental and  
Craniofacial Research Council

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Dr. Dushanka V. Kleinman  
Executive Secretary  
National Advisory Dental and  
and Craniofacial Research Council

## ATTACHMENTS

- I. Roster of Council Members
- II. Table of Council Actions
- III. Director's Report to the NADCRC, September 1999

NOTE: A complete set of open-portion handouts are available  
from the Executive Secretary.